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Issues relating to agriculture

Report on the workshop on the current state of scientific knowledge on how to enhance the adaptation of agriculture to climate change impacts while promoting rural development, sustainable development and productivity of agricultural systems and food security in all countries, particularly in developing countries, taking into account the diversity of the agricultural systems and the differences in scale as well as possible adaptation co-benefits

Note by the secretariat

Summary

The in-session workshop on the current state of scientific knowledge on how to enhance the adaptation of agriculture to climate change impacts while promoting rural development, sustainable development and productivity of agricultural systems and food security in all countries, particularly in developing countries, was organized on 12 November 2013, during the thirty-ninth session of the Subsidiary Body for Scientific and Technological Advice (SBSTA). In the presentations and discussions, workshop participants highlighted the importance of the consideration of climate change impacts on agriculture and food security, in the context of adaptation, economic growth and sustainable development, while taking into account the diversity of agricultural systems and possible adaptation co-benefits. They also highlighted the interlinkages between adaptation and the need for further advancing the scientific knowledge in the agriculture sector, taking into consideration financing, technology transfer and capacity-building needs, as well as enhanced cooperation, the sharing of experiences and the exchanging of information. Parties considered that the work of the SBSTA on agriculture, in accordance with the principles and provisions of the Convention, could play an important role in providing Parties with an opportunity to share information on adaptation practices and approaches, and explore ways to apply relevant scientific knowledge in agricultural adaptation and acquire new knowledge.

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I. Introduction

A. Mandate

1. The Conference of the Parties (COP), by decision 2/CP.17, paragraph 75, requested the Subsidiary Body for Scientific and Technological Advice (SBSTA) to consider issues relating to agriculture.

2. At its thirty-eighth session, the SBSTA invited Parties and admitted observer organizations[1] to submit their views on the current state of scientific knowledge on how to enhance the adaptation of agriculture to climate change impacts while promoting rural development, sustainable development and productivity of agricultural systems and food security in all countries, particularly in developing countries, while taking into account the diversity of the agricultural systems and the differences in scale as well as possible adaptation co-benefits.[2] The views of Parties are contained in document FCCC/SBSTA/2013/MISC.17 and Add.1 and 2.

3. At the same session, the SBSTA requested the secretariat to organize, subject to the availability of supplementary resources, an in-session workshop at SBSTA 39 on the issues referred to in paragraph 2 above. The SBSTA further requested the secretariat to prepare a report on the workshop for consideration at SBSTA 40.[3]

B. Scope of the note

4. This note contains an overview of the proceedings of the workshop, including a summary of the presentations that were made (chapter III), the main points made during the panel discussion (chapter IV) and a summary of the plenary discussion that took place at the end of the workshop (chapter V).

C. Possible action by the Subsidiary Body for Scientific and Technological Advice

5. The SBSTA may wish to consider the information contained in this document as part of its consideration of issues relating to agriculture, in accordance with the conclusions referred to in paragraph 2 above.

II. Proceedings

6. The workshop was organized as an in-session event during SBSTA 39. It took place in the morning of 12 November 2013. The workshop was open to all Parties and admitted observer organizations attending COP 19.

7. Mr. Richard Muyungi (United Republic of Tanzania), the Chair of the SBSTA, delivered the opening remarks and introduced the mandate and objectives of the workshop. He requested Ms. Selam Kidane Abebe (Ethiopia) and Mr. Hans Åke Nilsagård (Sweden) to co-facilitate the workshop.

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[1] Submissions from admitted observer organizations are available at <http://unfccc.int/7482>.

[2] FCCC/SBSTA/2013/3, paragraph 81.

[3] FCCC/SBSTA/2013/3, paragraph 83.

8. On behalf of the two co-facilitators, Mr. Nilsagård gave an introduction to the workshop and posed three questions to guide the panellists and facilitate discussions:

(a) What are the climate change impacts on agriculture observed in your country?

(b) What experience does your country have with practices and approaches for dealing with the adaptation of agriculture to climate change impacts?

(c) What experience does your country have with the application of scientific knowledge for enhancing adaptation in agriculture while promoting productivity and taking into account co-benefits?

9. The workshop was organized in three parts. Two introductory presentations by experts from the Intergovernmental Panel on Climate Change (IPCC) and the Food and Agriculture Organization of the United Nations (FAO) were given during part I. A panel discussion was organized during part II, when representatives from six Parties provided responses to the questions listed in paragraph 8 above. The workshop concluded with a plenary discussion during part III.

10. Further information on the workshop, including the agenda, information note, presentations by experts and statements by the panellists, is available on the workshop web page on the UNFCCC website.[4] Upon request, presentations and written statements submitted by Parties have also been made available on the same web page.

III. Summary of the presentations

11. The presentations of the representatives of the IPCC and FAO set the scene for the workshop discussions by highlighting the scientific aspects of adaptation and adaptation co-benefits from a global perspective. These presentations also highlighted the challenges, opportunities and success stories with regard to the practical implementation of adaptation and the identification of adaptation co-benefits in agriculture.

12. The first presentation, given by an IPCC expert, focused on the recent findings of the IPCC on climate change and agriculture based on the contribution of Working Group I to the Fifth Assessment Report of the IPCC, *Climate Change 2013: The Physical Science Basis*[5] and the *Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*.[6] The speaker explained that climate change and extreme weather events will have greater impacts on sectors linked to natural production, such as agriculture and forestry. Food security in particular is linked to the ability of the agricultural systems to adapt to these impacts.

13. The key IPCC findings on the impact of climate change and extreme events on agriculture were illustrated by examples for a number of regions, including Africa, Asia, North America, Oceania and Europe. The IPCC representative emphasized that strategies to manage risks stemming from extreme events could benefit substantially from improved projections and downscaled scenarios of climate change and improved predictions of the frequency and scale of extreme events.

14. An overview of climate change impacts on agriculture, fisheries and aquaculture was provided in the second presentation, given by a representative from FAO. In particular, the presenter provided a broad overview of the current state of the scientific knowledge and knowledge gaps, focusing on the short-term and long-term impacts of climate change on

[4] <http://unfccc.int/7887>.
[5] <https://www.ipcc.ch/report/ar5/wg1/>.
[6] <http://ipcc-wg2.gov/SREX/>.

different agricultural production systems. He also gave a brief introduction to some of the tools that FAO is providing to support countries' adaptation activities, for example, for climate scenarios and crop yield projections.

15. In his view, the main aim of the adaptation of agriculture to climate change impacts is to preserve the productivity of agricultural systems. This view was further supported by examples of different adaptation practices and approaches from all over the world, and emphasis was placed on adaptation to climate change being location specific. Hence, local circumstances have a substantial influence on such practices and approaches. He explained further that building resilience in agriculture requires careful consideration of the synergies between agriculture and other land uses (e.g. forestry), especially in drylands. The expert noted the importance of reaching out to farmers, and that a key approach for promoting adaptation is farmer-level engagement, taking into account that adaptation is a social learning process.

IV. Summary of the panel discussion

16. A panel discussion took place during the second part of the workshop, when representatives from six Parties provided responses to the questions listed in paragraph 8 above. Switzerland and India responded to the first question, Japan and Colombia to the second question and Ireland and Malawi to the third question.

17. When speaking about climate change impacts already observed in the country, Switzerland presented results of national climate change observations indicating an increase in mean annual temperature and changes in precipitation patterns that increase the risk of summer droughts. These changes resulted, inter alia, in heat stress on dairy animals and the emergence of new and more invasive pest species. Owing to the complex topography in Switzerland the effects of climate change were found to vary between regions but the frequency of extreme weather events has increased all over the country. The main challenge is to identify climate change impacts at specific locations in order to provide farmers with location-specific information. Such information could help farmers to take adaptation measures with a view to maintaining and increasing agricultural productivity. The need for adaptation and maintaining or even increasing agricultural productivity is reflected in the Swiss climate change strategy for agriculture. As part of this strategy, the Swiss agriculture sector committed to reduce greenhouse gas (GHG) emissions by at least one third by 2050.

18. Answering the same question, India indicated that agriculture is of crucial importance for food, nutrition and livelihood security. Climate change has already had a negative impact on the country's predominantly monsoon dependent agriculture, leading to losses/reductions in crops and animal production, including milk production and fisheries. India launched a National Mission for Sustainable Agriculture, which aims at devising appropriate adaptation strategies to support food security and economic stability. The National Initiative on Climate Resilient Agriculture focuses on long-term research on the impacts of climate change on agriculture and options for the adaptation of Indian agriculture, covering grain crops, horticulture, livestock and fisheries. The panellist emphasized that adaptation of agriculture to climate change requires support in terms of technology, finance, capacity-building, national and international research and development, and enhanced integration of indigenous, traditional and science-based knowledge and practices, as well as the exchange of information and the provision of technical advice on improving the efficiency, productivity and resilience of agriculture.

19. Japan addressed the second question, on experiences with the adaptation of agriculture to climate change impacts, by elaborating on the existing practices and approaches. The panellist presented national experiences with the development and

cultivation of climate change resilient varieties of rice and cultivation techniques, which proved their effectiveness in increasing productivity under climate change conditions. This included the introduction of an alternate wetting/drying technology used by farmers to reduce their water use in irrigated fields. The panellist also elaborated on the multilateral and bilateral collaboration with developing countries in which Japan is involved with a view to assisting them in making effective use of new rice varieties and cultivation techniques as a measure to adapt to climate change, while improving the productivity and resilience of agriculture and ensuring food security.

20. Answering the same question, Colombia stated that it prioritizes adaptation because of the high vulnerability of the agriculture sector to climate change impacts and a very high percentage of the population being dependent on that sector. The country is preparing an adaptation plan for agriculture which includes fisheries, fish farming and forestry. The objective of this plan is to reduce the vulnerability of agricultural production and to guarantee food security. The plan will focus, inter alia, on climate risk management and other activities, including capacity-building, with a focus on local levels in order to allow the local managers/local farmers to benefit from the national measures. The panellist expressed the view that there is a need for improving scientific knowledge (including modelling), enhancing capacity-building (including downscaling information for farmers) and providing technical assistance at all levels (national, regional and local).

21. Ireland, on behalf of the European Union (EU) and its 28 member States, in addressing the third question, on the application of scientific knowledge for enhancing adaptation in agriculture, informed the workshop participants that effective adaptation of agriculture is of critical importance for the EU. In addition, enhancing the resilience of farmers to threats posed by climate change and GHG emissions is set as an explicit objective of the EU Common Agricultural Policy. The results of research and assessment of agricultural vulnerabilities and the development of effective adaptation and mitigation measures are all incorporated into the EU strategy on adaptation to climate change. Complementing the activities of member States, the strategy supports action by promoting greater cooperation and information sharing between member States and by mainstreaming adaptation into all relevant EU policies, while ensuring that linkages with productivity, sustainability, efficiency and the mitigation of GHG emissions from agriculture are fully harnessed. Policies and measures of the EU, some of which also provide mitigation benefits, are applied in a context of national rural development programmes. The panellist further mentioned that the EU is open to sharing its local, national and regional experiences, as appropriate.

22. Answering the same question, Malawi, on behalf of the African States, informed the workshop participants that adaptation in agriculture is important for Africa, as its population is expected to double by 2050. Most of the African farming system is rain fed with predominantly small-scale subsistence farming, which makes it particularly vulnerable to the adverse impacts of climate change. Malawi emphasized that technical and financial support is needed for identifying and scaling up useful approaches for climate change adaptation in agriculture, including related capacity-building. Agriculture is an essential part of many of the national adaptation plans (NAPs) in African countries and adaptation co-benefits should allow for an increase in productivity, enhanced economic growth and poverty reduction. Malawi further informed the workshop participants that African countries have some positive experiences in applying scientific knowledge for enhancing adaptation while promoting productivity. These experiences include the application of seasonal rainfall forecasts and weather index-based crop insurance, the promotion of improved seed varieties which allow increased productivity of farmers, conservation agriculture and sustainable land management, water management and irrigation technologies, fertilizer management and agroforestry.

V. Summary of the plenary discussion

23. During part III of the workshop, Parties engaged in a general discussion, adding to and elaborating on the issues raised in the presentations and the panel discussions, and the questions posed by the co-chairs of the workshop.

24. Parties highlighted the important role of agriculture in national economies and the central role of the agriculture sector in ensuring food security. Developing country Parties further emphasized the important role of agriculture in poverty reduction, sustainable development and livelihoods. Parties also highlighted the importance of considering the interests of small and marginal farmers and indigenous communities, and the role of women in agriculture.

A. Climate change impacts on agriculture

25. All Parties noted that agriculture and food production are highly vulnerable to the adverse effects of climate change, particularly in developing country Parties. It was highlighted that although Parties have different national circumstances all face various impacts of a changing climate.

26. Parties reported on specific climate change impacts on agriculture observed in their countries, in particular the increasing frequency of extreme weather events, including: temperature stress (increasing day/night temperature, heat stress, extreme cold), changes in rainfall patterns (increase/decrease in average annual precipitation, short and heavy rainfall leading to flooding and landslides, erratic rainfall leading to droughts and progressive drying of land, and periodical water shortages).

27. Parties noted that changing climatic conditions and more frequent extreme weather events can reduce the production capacity of agriculture and affect rural livelihoods and food security. Some examples mentioned during the workshop included reduced agricultural production/yield, shift of cultivation area, decrease in area of arable land and increase in occurrence of pests and diseases. In this context, some Parties referred to the objective of the Convention with regard to ensuring that food production is not threatened.

28. In countries where the agriculture sector plays an important economic role, changing climatic conditions may also have socio-economic implications, such as reduction of the gross domestic product and an increased need for food imports. The need to enhance agricultural production for a growing population was also highlighted.

29. Parties discussed projections of future climate change impacts on agricultural productivity and recognized that the information available at the national level is often incomplete. They also mentioned that in general the impacts of climate change on agriculture will continue to have significant implications for rural development, sustainable development and food security. It was highlighted that there is high uncertainty with regard to information on the impact of climate change on the animal production segment and on fisheries.

B. Practices and approaches for dealing with adaptation of agriculture to climate change impacts

30. All Parties recognized the need to adapt agricultural practices and technologies to build more climate-resilient agriculture and allow for sustainable agricultural production. Many Parties emphasized that the adaptation of the agriculture sector to climate change impacts is an immediate need and a priority.

31. Parties mentioned that it is important to identify actions which will support the food production capacity and allow for its increase, taking into consideration human population growth. Such actions should strengthen the capacity of different agricultural production systems to adapt to the negative impacts of climate change, by building resilience and reducing vulnerabilities. The view was expressed that these actions should not constitute distortions to agricultural trade and production.

32. Developing country Parties emphasized that low adaptive capacity, lack of technologies and a weak infrastructure can increase the adverse effects of climate change on agricultural systems. Agricultural production systems in tropical and dry regions are often especially vulnerable to climate change impacts. In the absence of effective adaptation measures, climate change impacts can lead to the degradation of agricultural systems, loss of herbaceous cover and increased soil erosion, as well as increased GHG emissions.

33. A number of developing country Parties noted that ways and means to support adaptation while allowing for potential adaptation co-benefits should include financial support, the sharing of knowledge and best practices, the strengthening of institutional capacity, development and transfer of technology, capacity-building and exchange of or assistance from experts.

34. Some Parties informed the workshop participants on the preparation of their NAPs, which include elements of strategic approaches to adaptation in agriculture or responses to climate change impacts. Experiences with the joint preparation of the NAPs and nationally appropriate mitigation actions were also shared. The least developed countries emphasized that synergies between climate change policies and agricultural policies could be improved if more financial support were available for the development of NAPs.

35. Water deficits and droughts significantly decrease agricultural production. Addressing the issue of drought, many Parties provided information on the establishment of services for climate seasonal forecasting, drought monitoring or drought early warning systems as elements of their adaptation practices in agriculture. They mentioned the diverse approaches that they have followed to address the impact of drought. These approaches included: rainwater harvesting for irrigation purposes, integrated land use and water management, efficient use and conservation of water, improved water saving irrigation techniques and broader application of already available techniques of crop management, such as crop establishment/rotation, no-till techniques and crop–livestock integrated systems.

36. Parties also mentioned adaptation approaches that aim at diversification of agricultural activities to avoid the dependence of farmers on a single activity in order to reduce economic losses resulting from extreme weather events. In some countries, governments actively promote food diversification programmes in order to enhance the use of those sources of food and fodder which show weaker responses to the increase in temperature and require less water in their production cycle. In some countries, this includes the promotion of home gardens to increase the resilience of livelihoods to extreme weather events and improve national food security.

37. A number of Parties reported that the application of some adaptation techniques and approaches increases agricultural productivity and may allow for increased food production while reducing the land area used for agriculture. It was noted that the adoption of adaptation practices such as agroforestry or conservation tillage have also resulted in a number of co-benefits, including improved soil health, strengthened rural development, increased efficiency, sustainable land management, mitigation and some economic benefits. Parties further noted that it is important to find the best ways to achieve elements of these

co-benefits while at the same time improving the resilience of agricultural systems to climate change.

38. Several Partics highlighted the pilot application of technologies such as customized (prescribed) fertilizers, closed systems for aquaculture and cooling for livestock. Other Parties elaborated on other adaptation measures, such as the selection and genetic improvement of seeds or better informed choice among available varieties of seeds to achieve crop performance adapted to new agroclimatic conditions. Conservation of crop and livestock diversity is seen as an essential element of agricultural adaptation strategies in some countries. A group of Parties mentioned activities to promote the setting up of green infrastructure such as wooded riparian areas and buffer strips along water bodies/flood plains.

39. Several Parties spoke about adapted timings of agricultural practices, such as changing dates for sowing to respond to changes in precipitation and temperature. Some Parties noted that they apply the optimization of the time of sowing/harvesting based on weather forecasting and climate modelling. Increased planting of early maturing and drought-tolerant varieties of plants adapted to climate change and the breeding of more resilient and productive animals was also noted. Some Parties acknowledged that the use of existing technologies that were not previously suited to the location of the farm could also form a part of adaptation. In general, the importance of locally appropriate approaches for adaptation and efforts to engage farmers at the local level was highlighted.

40. Some Parties informed participants about the introduction of risk management tools (mutual funds, insurance) to protect farmers against the adverse impacts of climate variability and change, including index-based crop insurance schemes. It was also mentioned that farmers need incentives to encourage them to change existing agricultural practices for those allowing for improved resilience and adaptation.

C. Experiences with the application of scientific knowledge for enhancing adaptation in agriculture while promoting productivity and taking into account co-benefits

41. Parties highlighted the importance of the involvement of the research and scientific community or international science cooperation in the enhancement of existing practices and approaches to address adaptation, in particular seasonal climate forecasting, the development of drought-resistant crops and the improvement of pest management practices. Parties emphasized the importance of traditional knowledge and indigenous practices for crop and water management, and community-based adaptation.

42. Parties noted that existing adaptation strategies and methodologies are already largely based on the application of scientific knowledge in specific areas and activities. This includes monitoring and forecasting (i.e. weather prediction and early warning systems, identification and analysis of drought risk, pest and disease monitoring and forecasting), improvements in crops and livestock (i.e. development of new crop varieties and new cultivation techniques, conservation of crop and livestock diversity), optimization of fertilizer use and development of rainwater harvesting technologies. In this context, a group of Parties mentioned that, because of the limited capacity of their scientists and technicians, they had rather limited experience with applying scientific knowledge for enhancing adaptation in agriculture while promoting productivity and taking into account co-benefits.

43. It was acknowledged that the spectrum of adaptation options available in agriculture is broad, complex and diverse. There is a need to develop a better understanding of the range of impacts to be expected and the time frames and the degrees of severity of those

impacts, in order to be able to understand what particular adaptation options are available at defined locations.

44. The need for an assessment of the limits to adaptation was also identified during the discussion. In this context it was noted that when there is no possibility for effective adaptation, or climate variability overtakes the ability of farming systems to cope, there is a need to address loss and damage and develop a methodology for loss and damage in the agriculture sector. It was also mentioned that the limits of adaptation are linked to the importance of mitigation, bearing in mind the need to safeguard food security and the rights of small and marginal farmers.

45. Several Parties emphasized the importance of an understanding of the long-term macro-level impacts of climate change in order to develop national extension plans to train farmers. Parties highlighted the importance of improving the national availability of data at the farm level and enhancing the planning capacity of individual farmers and land managers. It was mentioned that cooperation among national and international institutions could play a role in promoting technology exchange among farmers. Traditional and indigenous knowledge also needs to be considered in the process of extending scientific knowledge to local farmers.

46. It was also noted that gaps in scientific knowledge remain in particular in the areas of vulnerability and risk assessments for extreme weather events, early warning systems and contingency plans, national planning for disaster response, institutional capacity and infrastructure maintenance, crop insurance systems, farmers' household resilience strategies, organic farming and application of traditional knowledge. Parties emphasized that there is a need for further research in order to deal with issues relating to climate change and identify improvements in agricultural productivity, resilience, water use efficiency and reduced input intensity. More research may also be needed to identify the best ways to enhance adaptation co-benefits, such as poverty eradication, sustainable land management, rural development and reduction of GHG emissions.

D. Other issues raised during the discussions

47. A number of Parties emphasized that the focus of the SBSTA considerations on issues relating to agriculture should remain on adaptation. Other Parties noted very limited chances for the agricultural systems to adapt to climate change in the case of a temperature increase beyond 4 °C and highlighted a need to identify areas where sustainable agriculture can contribute to mitigation efforts while also becoming more resilient and producing more food.

48. Parties further noted that the considerations of the SBSTA, in accordance with the principles and provisions of the Convention, could play an important role in providing opportunities for sharing scientific knowledge on adaptation practices and approaches among Parties (chapter V.B) and exploring ways to improve the role of this knowledge in supporting agricultural adaptation (chapter V.C). In particular, the following broad areas relating to possible further work were mentioned:

(a) The impacts of climate change on agriculture, taking into account adaptive capacity and vulnerability assessments, for example, with regard to droughts, pests, temperature variability and extreme weather events;

(b) Scientific and technological issues related to agriculture and climate change with a view to informing national actions, including making the link between macro-level impacts of climate change on agriculture and the farm-level responses while taking into account the diversity of global farm systems and possible adaptation co-benefits;

(c) Technologies, practices and know-how that improve the efficiency and productivity of agricultural systems and the exploration of ways and means of promoting the development and transfer of those technologies to strengthen the adaptive capacity of agriculture;

(d) Initiatives that could be launched for sharing experiences on adaption in agriculture, for example, by providing a platform for relevant information systems to interact;

(e) The role of loss and damage in the context of agriculture and adaptation;

(f) Options for improved cooperation in research and development at the national and international levels.